WHAT IS CLAIMED IS :

1. A method for the blind identification of sources within a system comprising P sources and N receivers, wherein the method comprises at least one step for the identification of the matrix of the direction vectors of the sources from the information proper to the direction vectors $\mathbf{a}_p$ of the sources contained redundantly in the m=2q order circular statistics of the vector of the observations received by the N receivers.

2. A method according to claim 1, wherein m = 2q order circular statistics are expressed according to a full-rank diagonal matrix of the autocumulants of the sources and a matrix representing the juxtaposition of the direction vectors of the sources as follows:

$$\mathbf{C}_{m,x} = \boldsymbol{A}_q\, \zeta_{m,s}\, \boldsymbol{A}_q^{H} \qquad \textbf{(11)}$$

where $\zeta_{m,s}$ = diag([$C_{1,1,\ldots,1,s}^{1,1,\ldots,1}, \ldots, C_{P,P,\ldots,P,s}^{P,P,\ldots,P}$]) is the full-rank diagonal matrix of the $m = 2q$ order autocumulants $C_{p,p,\ldots,p,s}^{p,p,\ldots,p}$ des sources, sized (P x P), and where $\boldsymbol{A}_q = [a_1^{\otimes(q-1)} \otimes a_1^{*} \ldots\ldots a_p^{\otimes(q-1)} \otimes a_p^{*}]$, sized ($N^q$ x P) and assumed to be of full rank, represents the juxtaposition of the P column vectors $[a_p^{\otimes(q-1)} \otimes a_p^{*}]$.

3. A method according to one of the claims 1 and 2, comprising at least the following steps:

<u>0</u>: the building, from the different observation vectors $\boldsymbol{x}(t)$, of an estimate $\hat{\mathbf{C}}_{m,x}$ of the matrix of statistics $\boldsymbol{C}_{m,x}$ of the observations,

<u>1</u>: the singular value decomposition of the matrix $\hat{\mathbf{C}}_{m,x}$, the deducing therefrom of an estimate P;^ of the number of sources P and a square root $\hat{\mathbf{C}}_{m,x}^{1/2}$ of $\hat{\mathbf{C}}_{m,x}$, for example in taking $\hat{\mathbf{C}}_{m,x}^{1/2} = \boldsymbol{E}_s\, |\boldsymbol{L}_s|^{1/2}$ where |.| designates the absolute value operator, where $\boldsymbol{L}_s$ and $\boldsymbol{E}_s$ are respectively the diagonal

matrix of the $\hat{P}$ greatest real eigenvalues (in terms of absolute value) of $\hat{\mathbf{C}}_{m,x}$ and the matrix of the associated orthonormal eigenvectors;

2: the extraction, from the matrix $\hat{\mathbf{C}}^{1/2}_{m,x} = [\Gamma_1^T, \ldots, \Gamma_N^T]^T$, of the N matrix blocks Γ_n : each block Γ_n sized $(N^{(q-1)} \times P)$ being constituted by the $N^{(q-1)}$ successive rows of $\hat{\mathbf{C}}^{1/2}_{m,x}$ starting from the "$N^{(q-1)}(n-1)+1$"th row;

3: the building of the $N(N-1)$ matrices $\Theta_{n1,n2}$ defined, for all $1 \leq n_1 \neq n_2 \leq N$, by $\Theta_{n1,n2} = \Gamma_{n1}^{\#} \Gamma_{n2}$ where # designates the pseudo-inversion operator;

4: the determining of the matrix V_{sol}, resolving the problem of the joint diagonalization of the N(N-1) matrices $\Theta_{n1,n2}$;

5: for each of the P columns $\boldsymbol{b}_p$ of $\hat{\boldsymbol{A}}_q$, the extraction of the $K = N^{(q-2)}$ vectors $\boldsymbol{b}_p(k)$ stacked beneath one another in the vector $\boldsymbol{b}_p = [\boldsymbol{b}_p(1)^T, \boldsymbol{b}_p(2)^T, \ldots, \boldsymbol{b}_p(K)^T]^T$;

6: the conversion of said column vectors $\boldsymbol{b}_p(k)$ sized $(N^2 \times 1)$ into a matrix $\boldsymbol{B}_p(k)$ sized $(N \times N)$;

7: the joint singular value decomposition or joint diagonalization of the $K = N^{(q-2)}$ matrices $\boldsymbol{B}_p(k)$ in retaining therefrom, as an estimate of the column vectors of $\boldsymbol{A}$, of the eigenvector common to the K matrices $\boldsymbol{B}_p(k)$ associated with the highest eigenvalue (in terms of modulus);

8: the repetition of the steps 5 to 7 for each of the P columns of $\hat{\boldsymbol{A}}_q$ for the estimation, without any particular order and plus or minus a phase, of the P direction vectors $\boldsymbol{a}_p$ and therefore the estimation, plus or minus a unitary trivial matrix, of the mixture matrix $\boldsymbol{A}$.

4. A method according to one of the claims 1 to 3 wherein the number of sensors N is greater than or equal to the number of sources P and wherein the method comprises a step of extraction of the sources, consisting of the

application to the observations $\boldsymbol{x}(t)$ of a filter built by means of the estimate $\boldsymbol{A}$;^ of $\boldsymbol{A}$.

5. A method according to one of the claims 2 to 4 wherein $\mathbf{C}_{m,x}$ is equal to the matrix of quadricovariance Qx and wherein m = 4.

6. A method according to one of the claims 2 to 4 wherein $\mathbf{C}_{m,x}$ is equal to the matrix of hexacovariance Hx and wherein m = 6.

7. A method according to one of the claims 1 to 6 comprising a step for the evaluation of the quality of the identification of the associated direction vector in using a criterion such that:

$D(A, \hat{A}) = (\alpha_1, \alpha_2, \ldots\ldots, \alpha_P)$

where

$$\alpha_p = \min_{1 \le i \le P} [d(\boldsymbol{a}_p, \hat{\boldsymbol{a}}_i)] \qquad (17)$$

and where $d(\boldsymbol{u},\boldsymbol{v})$ is the pseudo-distance between the vectors $\boldsymbol{u}$ and $\boldsymbol{v}$, such that :

$$d(\boldsymbol{u}, \boldsymbol{v}) = 1 - \frac{\left|\boldsymbol{u}^{H}\boldsymbol{v}\right|^2}{\left(\boldsymbol{u}^{H}\boldsymbol{u}\right)\left(\boldsymbol{v}^{H}\boldsymbol{v}\right)} \qquad (18)$$

8. A use of the method according to one of the claims 1 to 7 for a communications network.

9. A use of the method according to one of the claims 1 to 7 for goniometry using identified direction vectors.